24.6200,24.6510,
24.6520,24.6900

76971
SOV/56-37-6-11/55

AUTHORS: Bannik, B. P., Grishin, V. G., Danysh, M. Ya., Lyubimov, V. B., Podgoretskiy, M. I.

TITLE: Elastic Scattering of 8.7 bev Protons on Photographic Emulsion Nuclei

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1575-1582 (USSR)

ABSTRACT: A study was made of the elastic scattering of the 8.7 bev protons on photographic nuclear emulsions (type NIKFI-R, 450μ thick). The intensity of the irradiation was approximately 10^4 particles/cm^2. The proton beam passed along the chamber at a 0.7° angle to the plane of the emulsion layer. The distribution and measurement of tracks was done optically under 60 x 10 x 1.5 magnification. The selection of pairs was done according to the following conditions: (1) relativistic ionization; (2) projection of the angle formed by the track with the beam axis at angle $<2^\circ$; (3) distance between tracks not less than

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76971
SOV/56-37-6-11/5

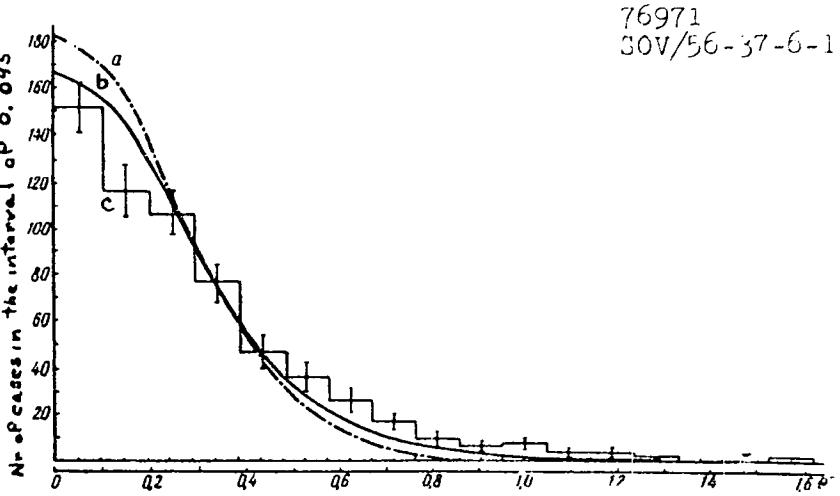

Fig. 1. The angular distribution at the distance R = 95 mm from the edge of emulsion chamber. (a) Calculated angular distribution compensated for the initial angular distribution at R = 5 mm and for multiple coulomb scattering; (b) calculated angular distribution compensated for the initial angular distribution, for the multiple coulomb scattering at $k_1 = 0$; (c) measured angular distribution.

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50-60 μ in the emulsion plane and 25-30 μ in the depth; and (4) visual absence of an inclination of the track toward emulsion layer. This method yielded 601 pairs of tracks at a 95-mm distance from the edge of the emulsion. The angular distribution of tracks is plotted in Fig. 1. The mean square root error involved in measuring the angular distribution was $\Delta\theta = 0.03^{\circ}$.

In a similar way was measured the angular distribution of 572 pairs at R = 5 mm. The differential and the total cross section of elastic scattering, $(d\sigma/d\Omega)_d$ and σ_d respectively, were calculated on the basis

of the optical model of J. W. Cronin, R. Coll, and A. Abashian (cf. Phys. Rev., 107, 1121, 1957):

$$\left(\frac{d\sigma}{d\Omega}\right)_d = \left| k_n \int_0^\infty (1 - \exp\{-\bar{\sigma}\rho_0 S(b)\}) J_n(k_n b \sin\vartheta)\, b\, db \right|^2$$

$$\sigma_d = 2\pi \int_0^\infty (1 - \exp\{-\bar{\sigma}\rho_0 S(b)\})^2 b\, db.$$

The analysis showed a good accord between the experimental data and the optical model, if compensation is made for refraction in the nucleus. The work was carried out under the guidance of I. M. Gramenitskiy; P. K. Markov and E. N. Tsyganov participated in the discussion of this work; calculations and measurements were done by V. M. Gorbunkov, A. I. Radionov, L. I. Aver'yanova, Z. P. Golovina, T. A. Zhuravleva, N. V. Kirsanova, M. P. Koteneva, A. I. Maklachkova, G. A. Nurusheva, and G. P. Tyupikova. The text contains 2 tables; 4 graphs; and 12 references, 6 Soviet, 1 U.K., 5 U.S. The 5 most recent U.S. and U.K. references are: 1958 Ann. Intern. Conf. on High Energy

Elastic Scattering of 8.7 bev Protons on Photographic Emulsion Nuclei

76971
SOV/56-37-6-11/55

Physics at CERN, Geneve, p 309; J. W. Cronin, R. Cool, A. Abashian, Phys. Rev. Nr 7, 1121, 1957; I. H. Atkinson, W. H. Hess, V. Perez-Mendez, R. W. Wallace. Phys. Rev. Lett., 2, 168, 1959; N. E. Booth, Mr. B. Ledley, D. Walker, D. H. White, Proc. Phys. Soc. A70 209, 1957; F. F. Chen, C. P. Leavitt, A. M. Shapiro, Phys. Rev. 99,857, 1955.

ASSOCIATION: Joint Inst. Nuclear Research, USSR (Ob'edinenyy institut yadernykh issledovaniy, SSSR)

SUBMITTED: June 9, 1959

Card 5/5

BIRGER, N.G.; VAN GAN-CHAN [Wang Kang-ch'ang]; VAN TSU-TSZEN [Wang TS'u-tsêng]; DIN DA-TSAO [Ting Ta-ts'ao], KATYSHEV, Yu.V.; KLADNITSKAYA, Ye.N.; KOPYLOVA, D.K.; LYUBIMOV, V.B.; NGUYEN DIN TY; NIKITIN, A.V.; PODGORETSKIY, M.I.; SMORODIN, Yu.A.; SOLOV'YEV, M.I.; TRKA, Z.

Inelastic interactions of 6.8 Bev/c π^--mesons with nucleons. Zhur. eksp. i teor. fiz. 41 no.5:1461-1474 N '61. (MIRA 14:12)

1. Ob"yedinennyy institut yadernykh issledovaniy.
(Collisions (Nuclear physics))
(Mesons) (Nucleons)

BIRGER, N.G.; WANG KANG-CH'ANG; WANG TS'U-TSÊNG; TING TA-TS'AO; KATYSHEV, Yu.V.; KLADNITSKAYA, Ye.N.; KOPYLOVA, D.K.; LYUBIMOV, V.B.; NGUEN DIN TY; NIKITIN, A.V.; PODGORETSKIY, M.I.; SOLOV'YEV, M.I.

[Inelastic interaction of 6.8 Bev/s π^--mesons and nucleons] Neuprugie vzaimodeistviia π^--mezonov s impul'som 6,8 Bev/s s neuklonami . Dubna, Ob"edinennyi in-t iadernykh issl., 1961. 30 p. (MIRA 14:11)

(Mesons) (Nucleons)

LYUBIMOV, V.B.; NIKITIN, A.V.; TRKA, Z.; SARANTSEVA, V.R., tekhn. red.

[Properties of π^0-mesons generated in inelastic collisions of 7 Bev π^--mesons with nucleons] Svoistva π^0-mezonov, obrazuiushchikhsia v neuprugikh stolknoveniiakh π^0-mezonov s nuklonami pri energii 7 BEV. Dubna, Ob"edinennyi in-t iadernykh issl., 1962. 7 p. (MIRA 15:6)

(Mesons) (Collisions (Nuclear physics))

S/056/63/044/002/057/065
B163/B186

AUTHORS: Lyubimov, V. B., Mu Tsun, Podgoretskiy, M. I., Sytnova, S. I., Strel'tsov, V. N., Trka, Z.

TITLE: Production of γ quanta in the interact[illegible] π⁻-mesons with nucleons

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiz[illegible], v. 44, no. 2, 1963, 760-765

TEXT: 395 inelastic π⁻-nucle[illegible] interactions, observed in [illegible] propane bubble chamber, involving 454 electron-positron pairs, were analyzed. The energy distribution of the γ quanta in the [illegible] system has, apart from the maximum corresponding to the [illegible] $\pi^0 \to \gamma\gamma$, a second maximum in the energy range E_γ = 250 ÷ 300 Mev, while in the energy range E_γ = 500 ÷ 600 Mev there seems to be another anomaly. The most probable explanation of the comparatively narrow second maximum at 250 ÷ 300 Mev is a decay of a η-meson according to $\eta \to 2\gamma$ (274 Mev) or $\eta \to \pi^0 + \gamma$ (258 Mev). The decay $\eta \to 2\gamma$ is in accordance with the assumption that the η-meson has the quantum numbers 0^{++} while there are strong

Card 1/2

Objections against a [illegible] $\to \pi^0 + \gamma$ decay. In order to find other possible sources of γ quanta, resonance states decaying according to $x \to \pi^+ + \pi^- + \gamma$ were considered. For this purpose the effective masses $M_{\pi\pi\gamma}$ of such systems were calculated. The resulting distribution showed no distinct maxima. When, however, the same distribution of $M_{\pi\pi\gamma}$ was plotted for the cases with E_γ between 500 and 800 Mev, a distinct peak was found at $M_{\pi\pi\gamma} = 750 \div 850$ Mev/c^2, but the number of events is not sufficient to evaluate this problem in greater detail. There are 3 figures.

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: November 20, 1962

L 10233-63 BDS/EWT(m)--AFFTC/ASD--IJP(C)

ACCESSION NR: AP3000038 S/0056/63/044/005/1481/1486

AUTHOR: Kopylova, D. K.; Lyubimov, V. B.; Podgoretskiy, M. I.; Kh. Rizayev; Trka, Z.

59
54

TITLE: Inelastic negative pion proton interactions at an energy of 7 BeV.

19

SOURCE: Zhurnal eksper. i teoret. fiziki, v. 44, no. 5, 1963, 1481-1486

TOPIC TAGS: pion proton interactions, inelastic, propane bubble chamber, two-prong stars, four-prong stars

ABSTRACT: A total of 154 cases of inelastic negative-pion proton interactions, accompanied by emission of a secondary proton with momentum from 180 to 500 MeV/c, were selected from stereo photographs taken with a propane bubble chamber placed in a beam of negative pions with momentum 5.8 BeV/c. This work is a continuation of an investigation in progress at the Joint Institute of Nuclear Research using a 24 - liter propane bubble chamber. An analysis of the selected events shows that they have several distinguishing features, characteristic of peripheral interactions. These features manifest themselves much less clearly

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L 10233-63
ACCESSION NR: AP3000038

5

in four-prong interactions than in two-prong ones. Also considered is a new criterion for separating interactions with a free proton, connected with the calculation of the so-called lacking mass, with the aid of which, in particular, it is shown that the fraction of background interactions with carbon is much larger in four-prong stars than in two-prong star ones. 'In conclusio ns, the authors are pleased to express their indebtedness to V. G. Grishin, G. I. Kopylov for useful discussions, and also V. N. Strel'tsiv and K. Igamberdiyev for help with the work.' Orig. art. has: 2 formulas and 7 figures.

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: 11Dec62 DATE ACQ: 12Jun63 ENCL: 00

SUB CODE: PH NR REF SOV: 003 OTHER: 007

Card 2/2

SHVEYKIN, G.P.; GEL'D, P.V.; LYUBIMOV, V.D.

Effect of the recrystallization of niobium pentoxide on the rate of its deoxidation. Izv. vys. ucheb. zav.; tsvet. met. 3 no.3:120-125 '60. (MIRA 14:3)

1. Ural'skiy politekhnicheskiy institut.
(Niobium oxide) (Crystallization)

LYUBIMOV, V. D.

Cand Tec Sci, Diss -- "On experience in the organization of mass production and improving technology in industries of the USSR in the period of the Great Patriotic War of 1941-1945". Leningrad, 1961. 19 pp including covers, 20 cm (Min of Higher and Inter Spec Educ RSFSR. Leningrad Polytec Inst imeni M. I. Kalinin), 150 copies, Not for sale (KL, No 9, 1961, p 183, No 24352). /61-51095/

S/149/61/000/005/003/008
A006/A101

AUTHORS: Lyubimov, V. D., Gel'd, P. V.

TITLE: Equilibrium during reduction of niobium pentoxide with hydrogen

PERIODICAL: Izvestiya vysschikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, no. 5, 1961, 145-151

TEXT: In previous studies made on the equilibrium in the Nb-O-H system, no special precautions against thermodiffusional complications had been taken. This may entail serious errors. Therefore new experimental investigations were carried out with refined niobium pentoxide containing over 99.9% Nb_2O_5 and roasted at 1,200°C. Niobium dioxide was prepared by the reduction of pentoxide in a hydrogen flow at 1,100°C. For the experiments either sintered $Nb_2O_5 + NbO_2$ tablets were used, or niobium pentoxide partially reduced with hydrogen. The equilibrium in these systems was studied by the circulation method at 900, 950, 1,000, 1,050 and 1,100°C and by the method of weight variation with a gas mixture where $P_{H_2O}^{-1} \cdot P^{-1}_{H_2} \leq 0.04$ at 880, 890, 910 and 940°C, and where it was [illegible], at 1,070, 1,090, 1,110 and 1,130°C. The results of measurements made by the aforementioned methods are compared between each other and with literature data

Card 1/3

Equilibrium during reduction ...

(Fig. 4). The values of equilibrium constants obtained by both the circulation and weight variation methods are in an excellent agreement. This confirms additionally the rapid interaction of hydrogen with higher Nb oxides and the attaining of an equilibrium in the system. Experimental data in the 900 - 1,000°C temperature range are well described by the empirical formula

$$\lg K = -\frac{14{,}400}{4.575T} + 1.29 \approx -\frac{3150}{T} + 1.29$$

Hence it follows that $\Delta H_{1,000^\circ C} = 14{,}400$ cal/mole and $\Delta Z \approx 14{,}400 - 5.9\,T$ (2). Numerical values of equilibrium constants obtained at 900 - 950°C are in a satisfactory agreement with data from reference 1 [P. Süe, C. r Acad. Sci. 208, 1088 (1939)] but rather in contradiction with those of references 2 [H. Schaefer, G Breil, Z. anorgan. allgem. Chem. 267, 265, 1952] and 3 [G. Grube, O. Kubashevskiy, K. Zwiauer, Z. Elektrochem. 45, 1939, 882, (1949)]. This points to a systematic error in the experiments of reference 3, whereas the difference in the equations obtained by the authors and given in reference 8 [F. G. Kusenko, P. V. Gel'd, Izv. VUZ, Tsvetnaya metallurgiya, no. 2, 43, 1961] is explained by the difference in the thermal effects. There are 4 figures, 1 table, and 11 references: 6 Soviet-bloc and 5 non-Soviet-bloc.

Card 2/3

Equilibrium during reduction ...

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: December 17, 1960

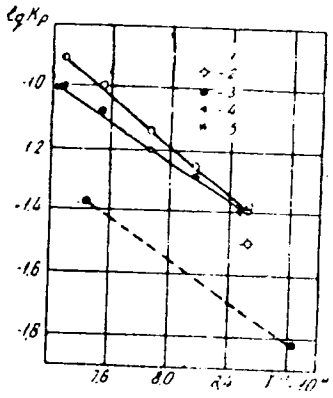

Fig. 4: The relation $K_p = P_{H_2O} \cdot P_{H_2}^{-1}$ from data presented by Sue (1), Scheafer and Breil (2), Grube, Kubashevskiy and Zwianer (3); 4 and 5 are the results of the present investigation with the use of the circulation method and the method of weight variation, respectively.

Card 3/3

33179

S/180/61/000/006/013/020
E026/E335

15 2600
18 7500

AUTHORS: Gel'd, P.V. and Lyubimov, V.D. (Sverdlovsk)

TITLE: Diffusion of Nb and C in Nb and its carbides

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no. 6, 1961, 119 - 126

TEXT: Diffusion in Nb and its carbides has been little studied, in spite of the fact that it is of considerable interest for judging the mechanism of the carbon-thermal reduction of oxides, of high-temperature oxidation of the metal, of the conditions of recrystallization and other processes associated with the migration of atoms. Therefore, the authors investigated the diffusionability of the components in the condensed phases of the system Nb-Co and in this paper the results are described which were obtained in studying the diffusion and self-diffusion of niobium and carbon in Nb and its carbides. In the investigations radioactive tracer techniques employing the isotopes Nb^{95} and C^{14} were used.

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3179
S/180/61/000/006/013/020
E026/E335

Diffusion of ....

The Nb used in the experiments was of 99.01% purity and it contained 0.94% Ta and 0.04% O; Ti, Fe, Si and C were not detected. The pores were closed and did not intercommunicate. The total volume of the pores was estimated at 13%, based on the results of measurement of the real and apparent specific weights.. The niobium carbides were synthesized from the niobium oxides and from acetylene black. The obtained powders were pressed into rods and sintered in a vacuum furnace at 1 600 - 1 700 °C. Homogenization and final sintering were at 2 200 °C for 20 hours. The self-diffusion of Nb^{95} into Nb and its carbides was determined on sintered metal with total porosities of 13 and 10%, respectively, in the temperature range 1 700 - 2 100 °C. The activation energy for self-diffusion of Nb is found to be ~ 84.5 kcal/g.atom. Samples prepared by sintering Nb powder show a little difference to those from forgings. The activation energy of diffusion of Nb in NbC is found to be ~55 kcal/g.atom. The diffusion of C was studied in Nb, the hexagonal carbide $NbC_{0.5}$ and the

Card 2/4

Diffusion of ....

face-centred cubic carbides $NbC_{0.75}$ and $NbC_{0.98}$. Activation energies for all these processes were found to be ~ 32 - 33 kcal/g.atom, although that for $NbC_{0.5}$ was less than that for $NbC_{0.98}$, probably due to the larger number of vacant sites in the hexagonal structure. The relationship of activation energy to the melting points, heats of sublimation and recrystallization temperatures is discussed and the validity of the derived relationships is shown by comparing with values for V and Ta. On the basis of the obtained data and semi-empirical relations, the heat of sublimation of Ta was estimated at 224 kcal/g.atom and the energy of activation of the process of self-diffusion of V was estimated at 68 kcal/g.atom. There are 5 figures, 3 tables and 18 references: 13 Soviet-bloc (two of which are translations from non-Soviet-bloc publications) and 5 non-Soviet-bloc. The four latest English-language references quoted are Ref. 1: W.B Pearson - A Handbook of Lattice Spacing and Structures of Metals and Alloys. L-NT. 1958;

Card 3/4

Diffusion of ....

Ref. 10 O. Kubaschewski, E. Evans - Metallurgical Thermochemistry, London-New York 1958. Ref. 12 R. Speiser P. Blackburn, H. Johnston - J. Electrochem. Soc., 1959, 106, 52; Ref. 16 R.W. Powers, M V Doyle - J. Metals, 1957, 9, (10), s.2, 1285.

SUBMITTED May 4, 1961

Card 4/4

S/080/62/035/007/005/013
D267/D307

AUTHORS: Gel'd, P.V. and Lyubimov, V.D.

TITLE: Kinetic peculiarities of the process of reducing [illegible] oxide with hydrogen

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 7, 1962, 1571-1579

TEXT: [illegible] the existing gap, the first stage of reduction ($Nb_2O_5 \rightarrow$ [illegible]) with H_2 has been studied from the point of view of kinetics. The very pure Nb_2O_5 used (0.05% Ti, 0.005% each of Si, Al, Fe and [illegible] and less than 0.1% Ta) had a specific surface of 0.1 m^2/g and consisted mainly of the high-temperature H modification. The method of continuous weighing was used. The process was studied at temperatures 700-1060°C and pressures 20 - 740 mm Hg. The kinetic characteristics point to the autocatalytic nature of the reduction process. The apparent energy of activation of the process is 24 kcal/g-atom. The rate of reaction varies as the 0.6th power of hydrogen pressure. The presence of extremely small

Card 1/2

traces of water vapor inhibits the process of reduction. The electrical conductivity of Nb_2O_5 and of the products of its reduction increases exponentially with temperature. The process was not inhibited by the gas exchange, nor was it limited by the mobility of ions in the lattices of oxides. The limiting stage is found in the reactions which take place at the boundary between the condensed and gaseous reagents. There are 7 figures.

SUBMITTED: June 22, 1961

Card 2/2

S/080/62/035/009/003/014
D204/D307

AUTHORS: Gel'd, P.V., and Lyubimov, V.D.

TITLE: The rate of reduction of Nb_2O_5 with carbon monoxide

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 9, 1962, 1940 - 1945

TEXT: The reduction of Nb_2O_5 with CO was studied at CO pressures (p_{CO}) of 20-300 mm Hg, at 800 - 1015°C, over periods of up to 4 hours. The starting oxide contained 0.05 % Ti, 0.005 % of each of Si, Al, Fe and <0.1 % Ta, and was preheated at 1100°C in vacuum before the experiments. It was assumed that under the above conditions the reduction proceeded only to Nb_2O_4; this was later confirmed by X-ray analysis of the products. The degree of reduction (n) of cold-pressed oxide crushed into 1 - 2 mm granules was largely independent of the rate at which CO was passed over them, but was considerably increased by raising the temperature; thus n was respectively ~10 and ~90 % at 800 and 1050°C, after 2 hours. The n/time

Card 1/2

plots were linear up to 950°C. Small (2 %) additions of Na and K carbonates to the Nb_2O_5 slightly accelerated the process; K_2CO_3 was most effective. An increase in the specific surface area (s) of the Nb_2O_5 particles (1.24, 6.10 and 10.53 m^2/g) promoted faster reaction but no linear relations were found between the rate of reaction and s, owing to the rapid recrystallization of the oxide and consequent, quick reduction of the surface area of the particles. The rate was also found to increase in proportion to $\sqrt{p_{CO}}$. The activation energy $\cong$ 25 kcal. It is concluded that the overall rate is governed by adsorptive and crystallochemical processes. There are 5 figures and 1 table.

SUBMITTED: August 7, 1961

Card 2/2

GEL'D, P.V.; LYUBIMOV, V.D.

Kinetic characteristics of the reduction of niobium pentoxide by hydrogen. Zhur.prikl.khim. 35 no.7:1472-1479 Jl '62. (MIRA 15:8)

(Niobium oxide) (Hydrogen)

L 19904-63 EWP(q)/EWT(m)/EWP(B)/BDS AFFTC/ASD JD/JG

ACCESSION NR: AP3005816 S/0226/63/000/004/0076/0078

AUTHORS: Gel'd, P. V. ; Lyubimov, V. D.

TITLE: Mobility activation energy of Nb and C in metallic niobium and it its carbides

SOURCE: Poroshkovaya metallurgiya, no. 4, 1963, 76-78

TOPIC TAGS: Nb, C, carbide , mobility, activation energy

ABSTRACT: The diffusion processes of Nb and C in both metallic niobium and its carbides were investigated. Niobium alloy containing 0.94% Ta and 0.04% O_2 was used in the study of Nb-95 diffusion. The total porosity of samples was 13% and 10%, and the experiments were made at 1700-2100C. The results obtained followed the exponential relationships. Activation energy was only slightly affected by the porosity, its average value being 346.4 Kj/mole. The activation energy of the niobium diffusion in carbide was 35% smaller. Experiments on carbon diffusion in Nb were made at 900-1100C. It was found that the coefficient of carbon diffusion varied exponentially with temperature. The average activation energy of C diffusion in carbides was about 131.2-135.3 Kj/g.atom. Activation energy of carbon diffusion in metal and in carbides differed very little: in $NbC_{0.98}$ it equaled 132.4 Kj/g.

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L 19904-63

ACCESSION NR: AP3005816

atom; in $NbC_{0.5}$ - 122.1 Kj/g.atom. This was due to the fact that Nb atoms in its carbides form dense lattices (cubic - in the first, hexagonal - in the second case) the interstices of which are similar in size. Orig. art. has: 4 figures and 4 formulas.

ASSOCIATION: Institut khimii Ural'skogo filiala AN SSSR (Institute of Chemistry, Ural Branch, Academy of Sciences, SSSR)

SUBMITTED: 14Apr62 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: ML NO REF SOV: 005 OTHER: 002

Card 2/2

GEL'D, P.V.; LYUBIMOV, V.D.

Activation energy of the process of autodiffusion of niobium in it's oxides. Izv. SO AN SSSR no.7 Ser.khim.nauk no.2:79-85 '63. (MIRA 16:10)

1. Ural'skiy filial AN SSSR, Sverdlovsk.

S/080/63/036/002/006/019
D204/D307

AUTHORS: Shveykin, G. P. and Lyubimov, V. D.

TITLE: Kinetics of the interaction of niobium carbides and oxides in vacuum

PERIODICAL: Zhurnal prikladnoy khimii, v.36, no. 2, 1963, 299-307

TEXT: The present article is a continuation of earlier work (Izv. AN SSSR, OTN, Metallurgiya i toplivo, 1, 45 (1959); Primeneniye vakuuma v metallurgii (Application of vacuum in metallurgy), Sb. st. pod red. L. A. Samarina, IMET im. A. A. Baykova, AN SSSR, M. (1960); ZhPKh, 35, 9 (1962)), which showed that Nb is conveniently obtained by (1) low temperature reduction of Nb_2O_5 with C (or rather CO) to NbC, $NoC_{0.8}$, and NbO_2, followed by (2) interaction of these oxides and carbides to Nb + CO; mechanism of stage (1) being often similar to that of the reduction of Fe, Cu etc. oxides. To study the mechanism of stage (2), in the present work the authors investigated the reactions

Card 1/3

Kinetics of the ...

$$NbC + 2NbO_2 = 3NbO + CO \quad (a)$$

$$Nb_2C + NbO = 3Nb + CO \quad (b)$$

$$5NbC + NbO_2 = 3Nb_2C + CO \quad (c)$$

Particle size was either <0.075 mm or between 0.075 and 0.105 mm. The reactants were bonded with glycol, pressed into 12 mm dia x 10 mm long cylinders and dried at 180°C. Reactions were studied in a carbon furnace, at 1400 - 1700°C, and 1.4 - 3 x 10^{-4} torr. Reactions (a) and (b) proceeded parabolically up to ~70% reduction, the energies of activation being 86.2 kcal/mole ((a), 40 - 50% reduction) and 41.5 - 89.5 kcal/mole ((b) 5 - 15% reduction). The rates (particularly of (b)) were affected by particle size and also depended on the degree of pressing and the rate at which CO was removed from the system. The mechanism is discussed; it is believed

that the greatest kinetic difficulties occur during the formation of metallic Nb. Diffusion processes, sinterability of the initial charge, and removal of gaseous products play an important part in these reactions. There are 5 figures.

SUBMITTED: October 5, 1961

L 39465-65 EPF(n)-2/EWP(k)/EWP(z)/EWA(c)/EWT(m)/EWP(b)/T/EWP(e)/EWP(t) Pf-4/ Pu-4 IJP(c) JD/JG

ACCESSION NR: AP4047878 S/0279/64/000/005/0137/0141

AUTHOR: Lyubimov, V.D. (Sverdlovsk); Gel'd, P.V. (Sverdlovsk); Shveykin, G.P. (Sverdlovsk)

TITLE: Self-diffusion of niobium in monocrystalline and fused samples

SOURCE: AN SSSR. Izvestiya. Metallurgiya i gornoye delo, no. 5, 1964, 137-141

TOPIC TAGS: niobium, self diffusion, diffusion rate, diffusion coefficient, monocrystalline niobium, fused niobium, porous niobium

ABSTRACT: The characteristic mass diffusion in niobium monocrystals and in fused metallic niobium samples tagged with Nb^{95} was determined by removing layers and measuring the integral activity of the remaining sample. X-rays showed the diffusion layer was monophased and contained an insignificant amount of impurities. There was little difference between the diffusion coefficients for the monocrystalline and the fused samples. D changed with temperature according to one of the following relationships:

$$D^{Nb}_{Nb.A.S} = 49 \cdot \exp\left(-\frac{115\,000}{RT}\right) \quad or \quad D^{Nb}_{Nb} = 17 \cdot \exp\left(-\frac{110\,000}{RT}\right)$$

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L 39465-65
ACCESSION NR: AP4047878

3

The energy of activation of the diffusion process in these compact samples was calculated: E = 110-115 kcal/g. at. The corresponding values for powdered Nb samples were determined earlier (Gel'd, P. V., Lyubimov, V. D., Izv. AN SSSR OTN, Metallurgia i topliva, 1961, No. 6, 119):

$$D^{Nb}_{Nb\,porous} = 5 \cdot 10^2 \exp\left(-\frac{84000}{RT}\right),$$ and E = 84 kcal/g. at.

Thus the coefficient of diffusion is dependent on the structure of the niobium.

"The authors are very thankful to Drs. K. Schlaubitz and E. Rexer (Institute of Applied Physics of Pure Materials, Dresden) for supplying the niobium monocrystals." Orig. art. has: 3 figures, 5 equations and 1 table.

ASSOCIATION: None

SUBMITTED: 27Jun63 ENCL: 00 SUB CODE: MM

NR REF SOV: 006 OTHER: 003

Card 2/2

L 01226-66 EWT(d)/EWP(e)/EWP(h)/ETC(m)/EWP(l) WW/JT

ACCESSION NR: AP5022133 UR/0030/65/000/008/0045/0050
001.89 (47)

AUTHOR: Lyubimov, V. D.

TITLE: The coordination of scientific work in the Soviet Union

SOURCE: AN SSSR. Vestnik, no. 8, 1965, 45-50

TOPIC TAGS: scientific organization, scientific research

ABSTRACT: The scientific councils on various complex and intradisciplinary problems at the Gosudarstvennyy komitet po koordinatsii nauchno-issledovatel'skikh rabot SSSR (State Committee for the Coordination of Scientific-Research Work of the SSSR), Akademia nauk SSSR (Academy of Sciences SSSR), academies of various federal republics, and the respective republican administrative organs play an important role in the development of Soviet sciences. This article 1) gives a brief outline of their structure and number; 2) gives brief examples of topics discussed by these committees and their decisions (if any); 3) describes their work in the field of scientific planning and their contribution to the removal of duplication of scientific efforts; and 4) gives generalized recommendations concerning the future operation of the above-mentioned committees.

Card 1/2

L 01226-66

ACCESSION NR: AP5022133

ASSOCIATION: Gosudarstvennyy komitet po koordinatsii nauchno-issledovatel'skikh rabot SSSR (State Committee for the Coordination of Scientific-Research Work of the SSSR)

SUBMITTED: 00	ENCL: 00	SUB CODE: GO
NO REF SOV: 000	OTHER: 000	

Card 2/2

L 10852-66 EWP(e)/EWT(m)/EPF(n)-2/EWP(t)/EWP(b) IJP(c) JW/WW/JG/WB

ACC NR: AP5025652 SOURCE CODE: UR/0080/65/038/010/2174/2181

AUTHOR: Lyubimov, V. D.; Gel'd, P. V.; Shveykin, G. P.; Alyamovskiy, S. I.

ORG: none

TITLE: Kinetics of the reduction of lower niobium oxides with carbon

SOURCE: Zhurnal prikladnoy khimii, v. 38, no. 10, 1965, 2174-2181

TOPIC TAGS: niobium compound, chemical reduction, carbon

ABSTRACT: Pressed NbO_2 + C and NbO + C powder mixtures were heated at 1200-1600°C, and the kinetics of reduction of NbO_2 and NbO were studied in a vaccum as a function of temperature, compacting pressure and presence of additives (K_2CO_3, Na_2CO_3, $CaCO_3$, TiO_2). The degree of reduction was studied as a function of temperature, time, type of carbon and amount of graphite. The reduction process was found to be complex. Under certain conditions, in addition to the usual two-stage mechanism of direct reduction, intermediate niobium carbides form. Because of its diffusive nature, the decomposition of these carbides is kinetically hindered to a considerable degree. While the initial stages of the interaction the rate-determining factor is the gasification of carbon, during the final stages the rate-determining processes involve diffusion. It is concluded that in order to accelerate the reduction, it is necessary to avoid the formation of niobium oxycarbides, e. g., by maintaining a high vacu-

UDC: 531.1+542.941+546.882

Card 1/2

L 10852-66

ACC NR: AP5025652

um in the vicinity of the reaction zones, i. e., in the microvolumes of the charge.. Orig. art. has: 6 figures, 1 table.

SUB CODE: 07/ SUBM DATE: 26Sep63/ ORIG REF: 016/ OTH REF: 003

HW

Card 2/2

L 44400-66 EWT(m)/T/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6023641 SOURCE CODE: UR/0149/66/000/002/0135/0141

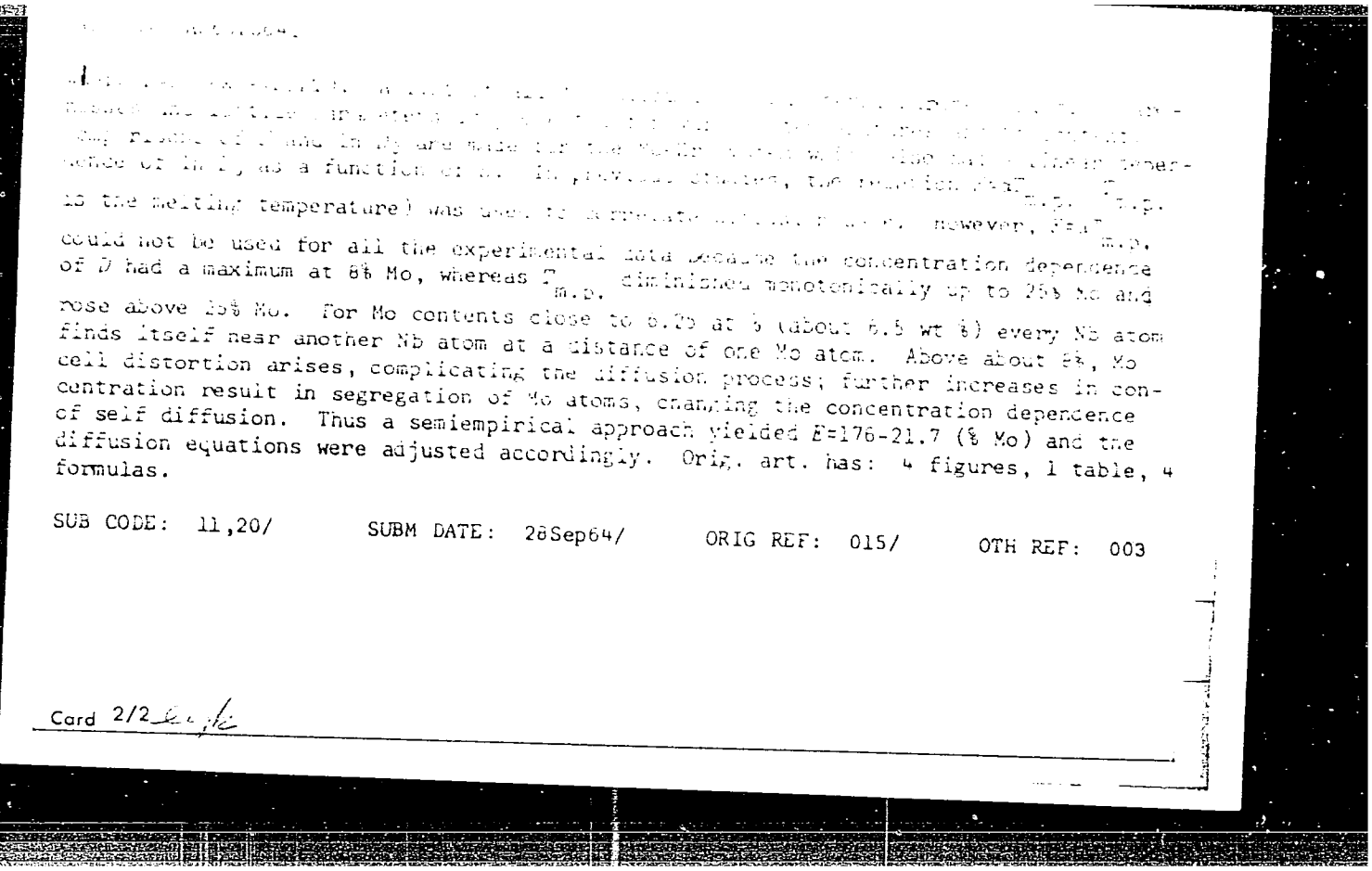
AUTHOR: Gel'd, P. V.; Vel'mozhnyy, E. Ya.; Lyubimov, V. D.; Shveykin, G. P.

ORG: Chair of Physics, Ural Polytechnic Institute (Ural'skiy politekhnicheskiy institut Kafedra fiziki)

TITLE: Self diffusion of niobium in some of its alloys with molybdenum

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 2, 1966, 135-141

TOPIC TAGS: niobium containing alloy, molybdenum containing alloy, activation energy, radioisotope, x ray diffraction, temperature dependence



could not be used for all the experimental data because the concentration dependence of D had a maximum at 8% Mo, whereas $T_{m.p.}$ diminished monotonically up to 25% Mo and rose above 25% Mo. For Mo contents close to 0.29 at % (about 0.5 wt %) every Nb atom finds itself near another Nb atom at a distance of one Mo atom. Above about 8%, Mo cell distortion arises, complicating the diffusion process; further increases in concentration result in segregation of Mo atoms, changing the concentration dependence of self diffusion. Thus a semiempirical approach yielded E=176-21.7 (% Mo) and the diffusion equations were adjusted accordingly. Orig. art. has: 4 figures, 1 table, 4 formulas.

SUB CODE: 11,20/ SUBM DATE: 28Sep64/ ORIG REF: 015/ OTH REF: 003

Card 2/2

ACC NR: AP6027750 EWT(m)/EWP(t)/ETI IJP(c) JD/WW/JW/JG (A)
SOURCE CODE: UR/0370/66/000/004/0132/0138

AUTHOR: Lyubimov, V. D. (Sverdlovsk); Gel'd, P. V. (Sverdlovsk); Shveykin, G. P. (Sverdlovsk); Vel'mozhnyy, E. Ya. (Sverdlovsk)

ORG: None

TITLE: Self-diffusion of niobium in alloys with titanium and zirconium

SOURCE: AN SSSR. Izvestiya. Metally, no. 4, 1966, 132-138

TOPIC TAGS: metal diffusion, niobium base alloy, zirconium containing alloy, titanium containing alloy

ABSTRACT: The authors study the parameters of self-diffusion of niobium in various alloys with titanium and zirconium. Unlimited series of solid solutions of niobium with β-Ti and β-Zr are formed in these systems over a wide temperature range (from approximately 1000-1100°C to the melting points). The dimensions of component atoms in alloys of niobium with titanium (as well as their lattice parameters) are extremely close (r_{Nb}=1.45 Å, r_{Ti}=1.46 Å). The atomic radii of the components in the Nb-Zr system differ considerably (r_{Zr}=1.6 Å) so that the periods of the elementary cell are considerably dependent on composition. Thus a comparison of the characteristics of niobium alloys with β-titanium and β-zirconium is of interest from the standpoint of the

Card 1/2

UDC: 669.293.5'295'296

L 07383-67
ACC NR: AP6027750

effect which the size factor has on the diffusion mobility of niobium atoms. Homogeneous β-phase alloys were melted with various concentrations of titanium (5.0, 15.1, 29.8 and 40.9%) and zirconium (5.0, 15.1, 24.2 and 36.1%). The coefficient of self-diffusion of niobium in the solid solutions was studied by using Nb^{95} with the removal of layers and measurement of the integral radioactivity. Self-diffusion was studied as a function of alloy composition and temperature from 1400 to 1950°C. It was found that an increase in the concentration of alloying elements raises diffusion mobility while reducing the activation energy and the preexponential fact r. The addition of niobium to titanium reduces the activation energy more rapidly than in the case of Nb-Mo alloys. The activation energy in Nb-Ti alloys changes more rapidly with the preexponential factor than in Nb-Mo alloys. This is probably due to the difference between the atomic ratios of the components and the length of the elementary displacement as well as to the activation spaces produced by the impurity atoms. In spite of the considerable difference between the atomic radii of zirconium and niobium, the effect of zirconium on activation energy and preexponential factor is much weaker than that of titanium. This is apparently due to the fact that the rate of diffusion depends not only on the atomic radii but also on the potential fields and vibration frequencies of the atoms. It is shown that there is a simple linear relationship between activation energy and the logarithm of the preexponential factor. There is a regular increase in the correlation factor with the dimensions of the alloying atoms (Mo, Ti and Zr). Orig. art. has: 4 figures, 2 tables, 5 formulas.

SUB CODE: 11,07 SUBM DATE: 12Mar65/ ORIG REF: 010/ OTH REF: 003

Card 2/2 hs

LYUBIMOV, V.G.

Machining annealed G12 manganese steel. Stan. i instr. 29 no.7:27-29 Jl '58. (MIRA 11:9)
(Steel-manganese alloys)

LYUBIMOV, V. G., Cand Tech Sci -- (diss) "Research into the process of cutting austenite manganese steel in the heated state." Moscow, Scientific and Technical Publishing House Division of the TsNIITMash, 1960. 18 pp; (State Committee of the Council of Ministers USSR for Automatization and Machine-Building, Central Scientific Research Inst of Technology and Machine-Building, [abbreviated]: TsNIITMash); 150 copies; free; (KL, 26-60, 136)

YATSYUK, A.I.; LYUBIMOV, V.G.; BATIN, I.V.; PLOSROHANSKIY, M.S.

Practices in wood polishing by abrasive wheels at the Mukachevo Furniture Combine. Bum. i der. prom. no.2:26-28 Ap-Je '65. (MIRA 18:6)

YATSYUK, A.I., kand.tekhn.nauk; LYUBIMOV, V.G., kand.tekhn.nauk

Abrasive wheels for wood polishing. Der. prom. 11 no.9:6-7 S '62.
(MIRA 17:2)

YATSYUK, A.I., kand.tekhn.nauk; LYUBIMOV, V.G., kand.tekhn.nauk

Manufacture of abrasive wheels for wood polishing. Bum. i der. prom. no.3:31-34 Jl-S '63. (MIRA 17:2)

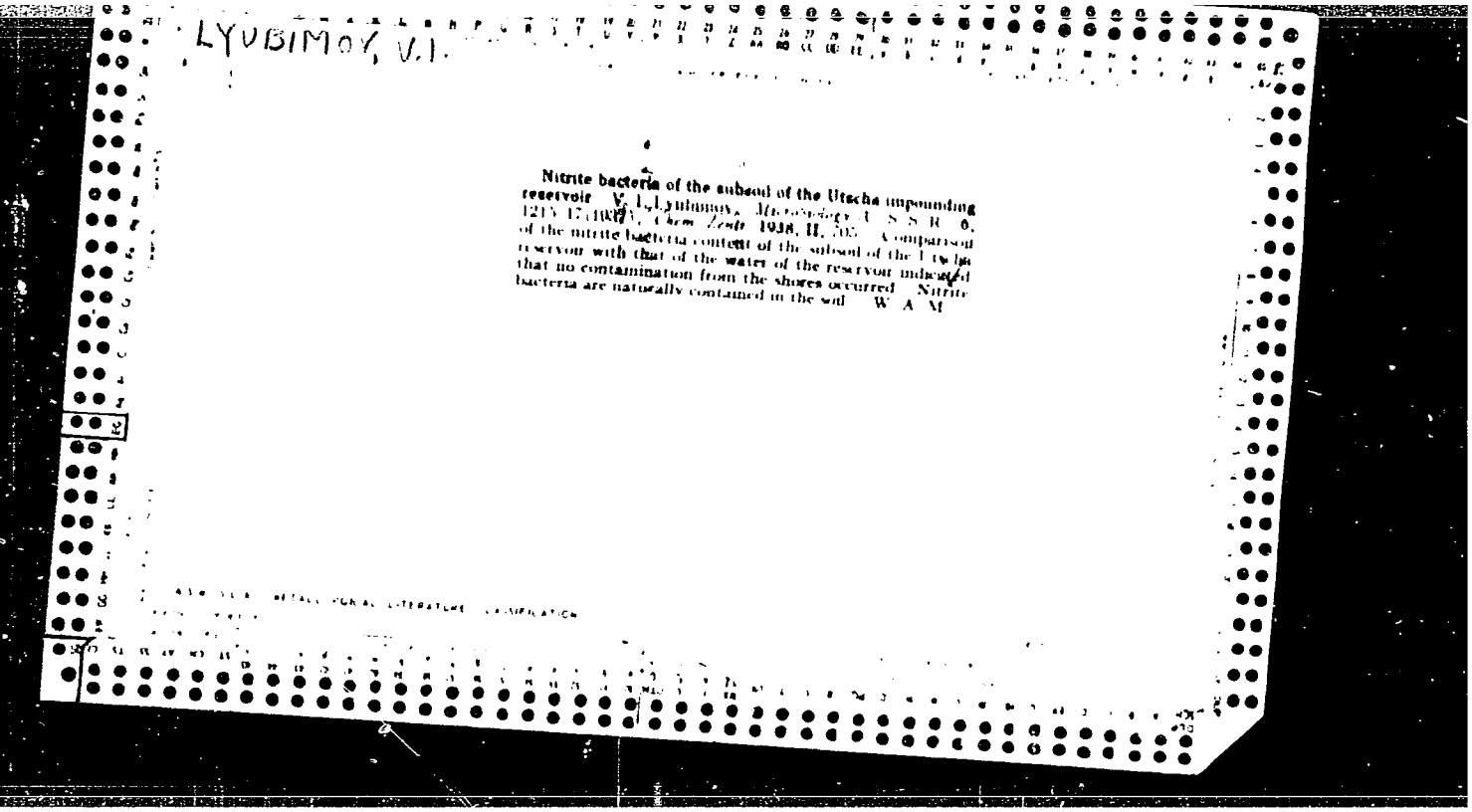
YATSYUK, A.I., kand. [illegible] nauk; [illegible], [illegible], [illegible]; PIOSHCHANSKIY, [illegible]

Flexible abrasive wheels for wood polishing. Bum. i der. prom. no.3:13-1[illegible] [illegible] [illegible]

[illegible]

YATSYUK, A.I., kand. tekhn. nauk; LYUBIMOV, V.G., kand. tekhn. nauk; PYNGRIN, P.N., inzh.

Two-spindle surface-grinding machine for polishing office equipment. Les., bum. i der. prom. no.1:9-13 '65.
(MIRA 18:12)



LYUBIMOV, V.I.

Nitrite bacteria of the subsoil of the Utcha impounding reservoir. V. I. Lyubimov. *Mikrobiologiya* (U.S.S.R.) 6, 1215-17 (1937); *Chem. Zentr.* 1938, II, 705. A comparison of the nitrite bacteria content of the subsoil of the Utcha reservoir with that of the water of the reservoir indicated that no contamination from the shores occurred. Nitrite bacteria are naturally contained in the soil. W. A. M.

IVUPENOV V. I. Mar/Apr. 4[illegible]

USSR/ Medicine - Antibiotics
Medicine - Bacteria, Culture

"Lytic Phenomenon in Actinomyces Griseus Cultures," Ts. Z. Login[illegible]ya, V. I. Ivu[illegible], Cen Inst of Epidemiol and Microbiol, Min of Health USSR, Moscow, 6 pp

Mikrobiologiya" Vol XVII[illegible], No 2

Observed results identical to those of Dmitriyeva and Wiebols, but no autolytic action as described by Krasil'nikov. A. griseus is used in manufacture of streptomycin. However, cultures with lytic factors cannot be used. One of best methods to avoid cultural failures is selection of cultures indicating no lytic action. Concludes: natural existence of phages of actinomyces is possible. Submitted 20 May 48.

PA 44/49T85

CA LYUBIMOV, V. I. //C

Oxidation-reduction potentials in cultures of acetic bacteria. V. I. Lyubimov (Lomonosov People's Univ., Moscow). *Mikrobiologiya* 19, 83-9(1950). Cultures of *Bact. xylinoides*, *Bact. rasi acetati*, and *Bact. currum* were tested for r_H and biochem. activity, in 0.5% yeast water contg. 0.25% EtOH, and 5% aldehyde-free EtOH. Changes in E_H and r_H as related to biochem. activity are tabulated. Cultures freely exposed to O_2 show reducing conditions not explainable by consumption of O_2 dissolved in the medium. During active dehydrogenation of EtOH to AcH and AcOH there is a sharp drop in r_H to 7-8. Peroxidation of AcOH occurs at a high r_H level (20-22).
Julian F. Smith

- Inst. of Botany

LYUBIMOV, V. I. (Vet Physician)

USSR/Medicine, Veterinary - Immunization Sep 52

"Anaphylactic Shock in Swine Resulting From Passive Immunization," B. N. Kazakov, Cand in Vet Sci, V. I. Lyubimov, Vet Physician, Moscow Vet Acad

"Veterinariya" Vol XXIX, No 9, p 57

Passive immunization of swine, which have never been immunized before, with 20 cc antierysipelas serum injected subcutaneously behind the right ear, produces anaphylaxis. In order to avoid any reaction, the authors recommend that 1 cc of the serum be administered 1st and a full dose of 20 cc be injected 30 min later.

225T26

USSR.

Microaerator; apparatus for research in the physiology of aerobic microorganisms. V. I. Lyubimov (Sci. Research Lab., Trust "Mosochistvod," Lyubertsk). *Mikrobiologiya* 23, 684-6(1954).—The app. is adapted for convenient pH and oxidation-reduction potential detns. and can be used with small samples, e.g. for isotope-labeled compds.
Julian P. Smith

USSR/ Biology - Microbiology

Card 1/1 Pub. 22 -47/56

Authors : Lyubimov, V. I., and Kagan, Z. S.

Title : Urease and arginase in certain types of Azotobacter

Periodical : Dok. AN SSR 99/5, 845-848, Dec 11, 1954

Abstract : The presence of active arginase and urease in Azotobacter and their connection with the appearance of NH_3 in Azotobacter cultures are discussed. Comparative determination of urease activity in Micrococcus urease cells which reaches its maximum at pH 6,8, showed that Azotobacter cells contain more urease than uro-bacteria. The physiological importance of the urea splitting process in bacteria and the spreading of urease among the bacteria is explained. Twelve references: 6-USSR; 3-USA and 3-German (1926-1954). Tables; graph; drawing

Institution : .....

Presented by: Academician V. N. Shaposhnikov, October 5, 1954

LYUBIMOV, V. I.

AID P - 1407

Subject : USSR/Medicine

Card 1/1 Pub. 37 - 4/23

Authors : Lyubimov, V. I., Kand. of Biol. Sci.
Kagan, Z. S., Junior Scientific Worker

Title : Adsorption of ferments by active silt.

Periodical : Gig. i san., 1, 16-18, Ja 1955

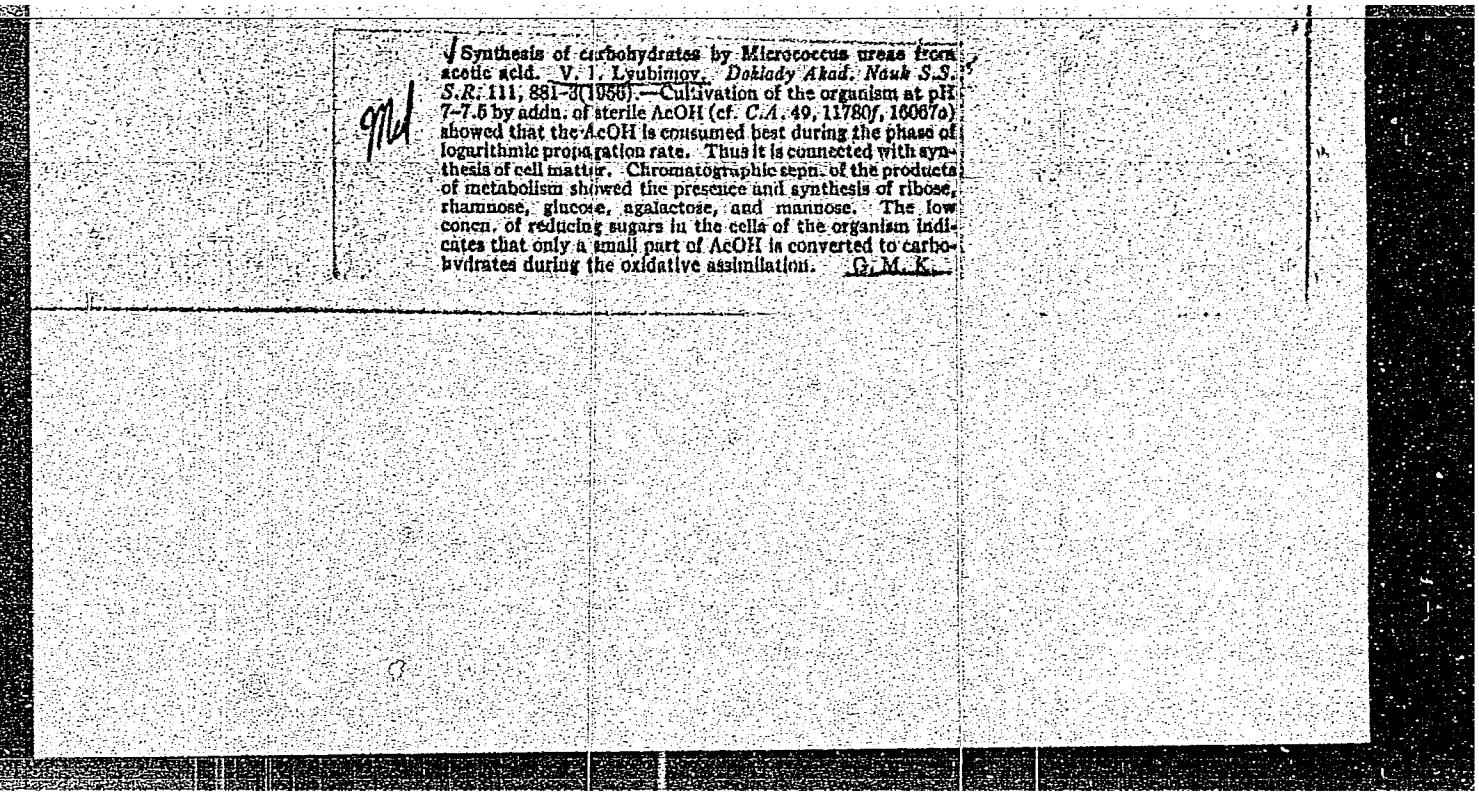
Abstract : A study of silt as a "catalyst" in the process of sewage purification, its fermentation properties and the increase in its activity due to the adsorption of ferments discharged by bacteria. 3 tables, 5 ref., 1923-1946.

Institution: Scientific Research Dept. of the Moscow Trust "MOSOCHISTVOD" of the Administration of Water Supply and Sewage System of the Moscow Municipal Council of Workers' Deputies.

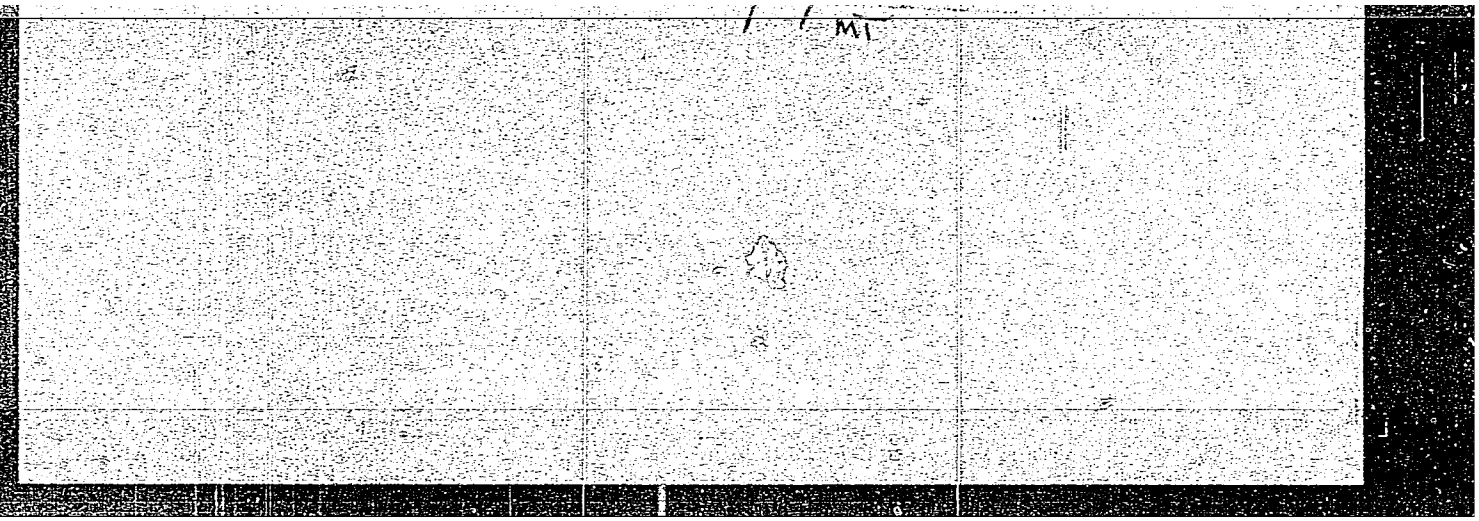
Submitted : My 10, 1954

Lyubimov V.I

Bacterial breakdown of urea as an intranuclear process. V. I. Lyubimov. *Mikrobiologiya* 24, 160-3(1955).—Urease elaborated by *Micrococcus ureae* and *Proteus vulgaris* cultures is mainly formed during aging and disintegration of the cells; these organisms do not develop urease in the surrounding medium. It is only during massive decadence of cells that a slight urease activity appears in filtrates from the cultures. In living cells the breakdown of urea is an intranuclear process. With *M. ureae* the peak of urease activity occurs at a pH level slightly below 7. Julian F. Smith



Synthesis of carbohydrates by Micrococcus ureae from acetic acid. V. I. Lyubimov. *Doklady Akad. Nauk S.S.S.R.* 111, 881–3(1956).—Cultivation of the organism at pH 7–7.5 by addn. of sterile AcOH (cf. *C.A.* 49, 11780*f*, 16067*a*) showed that the AcOH is consumed best during the phase of logarithmic propagation rate. Thus it is connected with synthesis of cell matter. Chromatographic sepn. of the products of metabolism showed the presence and synthesis of ribose, rhamnose, glucose, agalactose, and mannose. The low concn. of reducing sugars in the cells of the organism indicates that only a small part of AcOH is converted to carbohydrates during the oxidative assimilation. G. M. K.



LYUBIMOV, V.I., KAGAN, Z.S.

Dynamics of volatile organic acids produced during anaerobic decomposition of organic matter by micro-organisms in methane tanks [with summary in English]. Mikrobiologiia 27 no.4:484-488 Jl-Ag '58 (MIRA 11:9)

1. Lyuberetskaya laboratoriya nauchno-issledovatel'skogo otdela tresta "Mosochistvod."
(ACIDS, metabolism,
volatile organic acid form. by microorganisms in methane tanks (Rus))
(MICROORGANISMS, metabolism
synthesis of volatile organic acids by organic decomposition in methane tanks (Rus))

LYUBIMOV, V.I.; TSEPLYAYEVA, Z.S.

Scientific information in the field of biological chemistry.
Biokhimiia 25 no.5:974-976 S-O '60. (MIRA 14:1)
(BIOCHEMISTRY—PERIODICALS)

LYUBIMOV, V.I.

Fixation of molecular nitrogen by cell-free preparations from microorganisms. Izv. AN SSSR Ser. biol. 28 no.5:681-692 S-O'63 (MIRA 16:11)

1. Institute of Biochemistry, Academy of Sciences of the U.S.S.R.

LYUBIMOV, V.I.; KAGAN, Z.S.; VASILEYKO, M.A.; POPOVA, O.Ye.

Decomposition of volatile organic acids by microorganisms of "active sludge". Mikrobiologiia 32 no.4:700-702 Jl-Ag '63. (MIRA 17:6)

1. Lyuberetskaya laboratoriya nauchno-issledovatel'skogo otdela tresta "Mosoch'stvod.

L 39297-65 EWG(j)/EWG(r)/EWT(l)/FS(v)-3/EWG(v)/EWG(a)-2/EWG(c) Pe-5 DD

ACCESSION NR: AP5011332 UR/0216/64/000/004/0546/0560

33
B

AUTHOR: Lyubimov, V. I.

TITLE: Ferrodoxins - - new electron carriers which participate in the fixation of molecular nitrogen and in photosynthesis

SOURCE: AN SSSR. Izvestiya. Seriya biologicheskaya, no. 4, 1964, 546-560

TOPIC TAGS: photosynthesis, nitrogen, electron, plant metabolism

Abstract: The article reviews primarily non-Soviet literature on ferrodoxins and their participation in nitrogen fixation and photosynthesis.
Orig. art. has 8 figures and 6 formulas.

ASSOCIATION: Institute of Biochemistry, Academy of Sciences of the SSSR, Moscow

SUBMITTED: 00 ENCL: 00 SUB CODE: LS

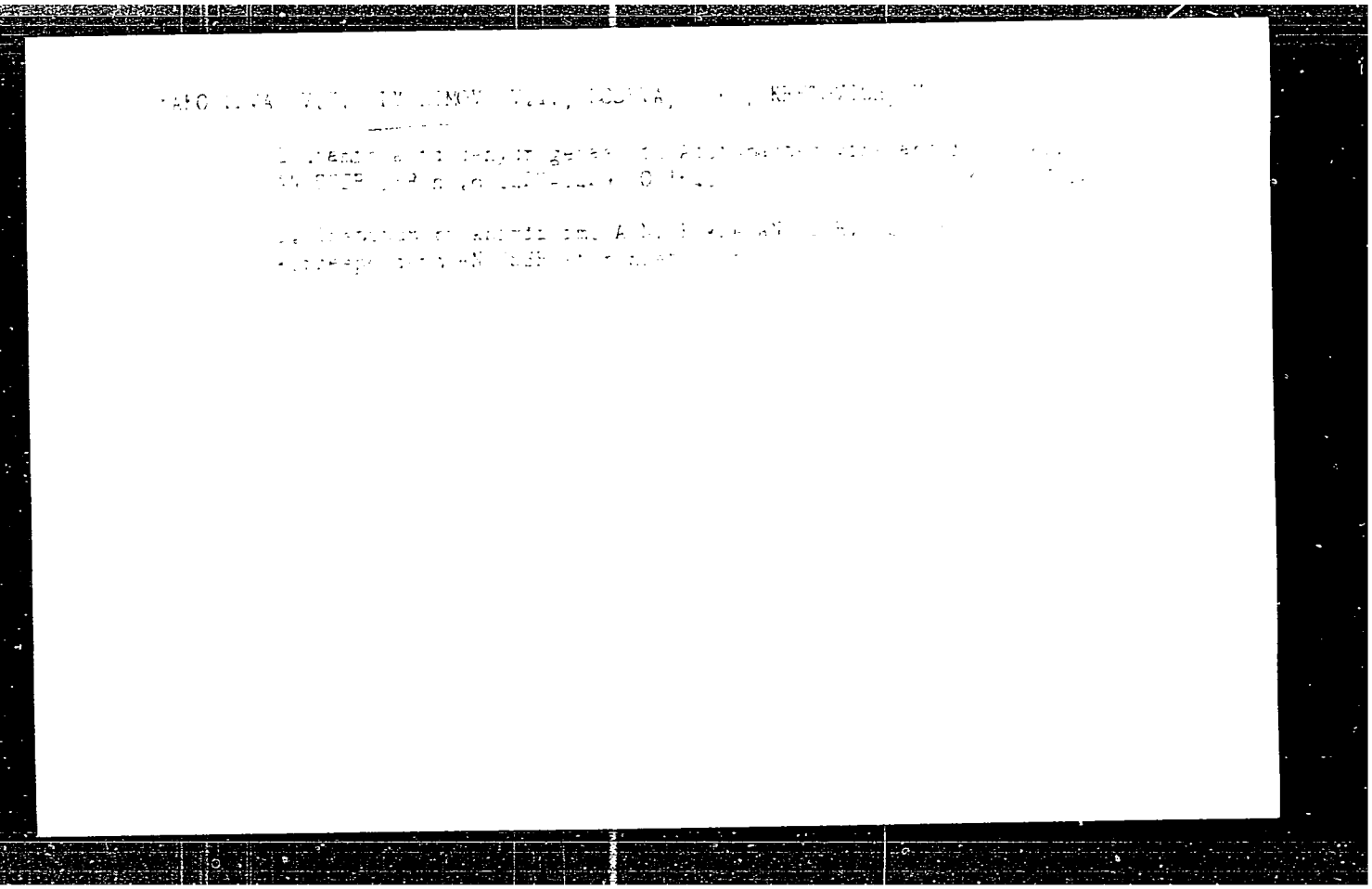
NO REF SOV: 002 OTHER: 024 JPRS

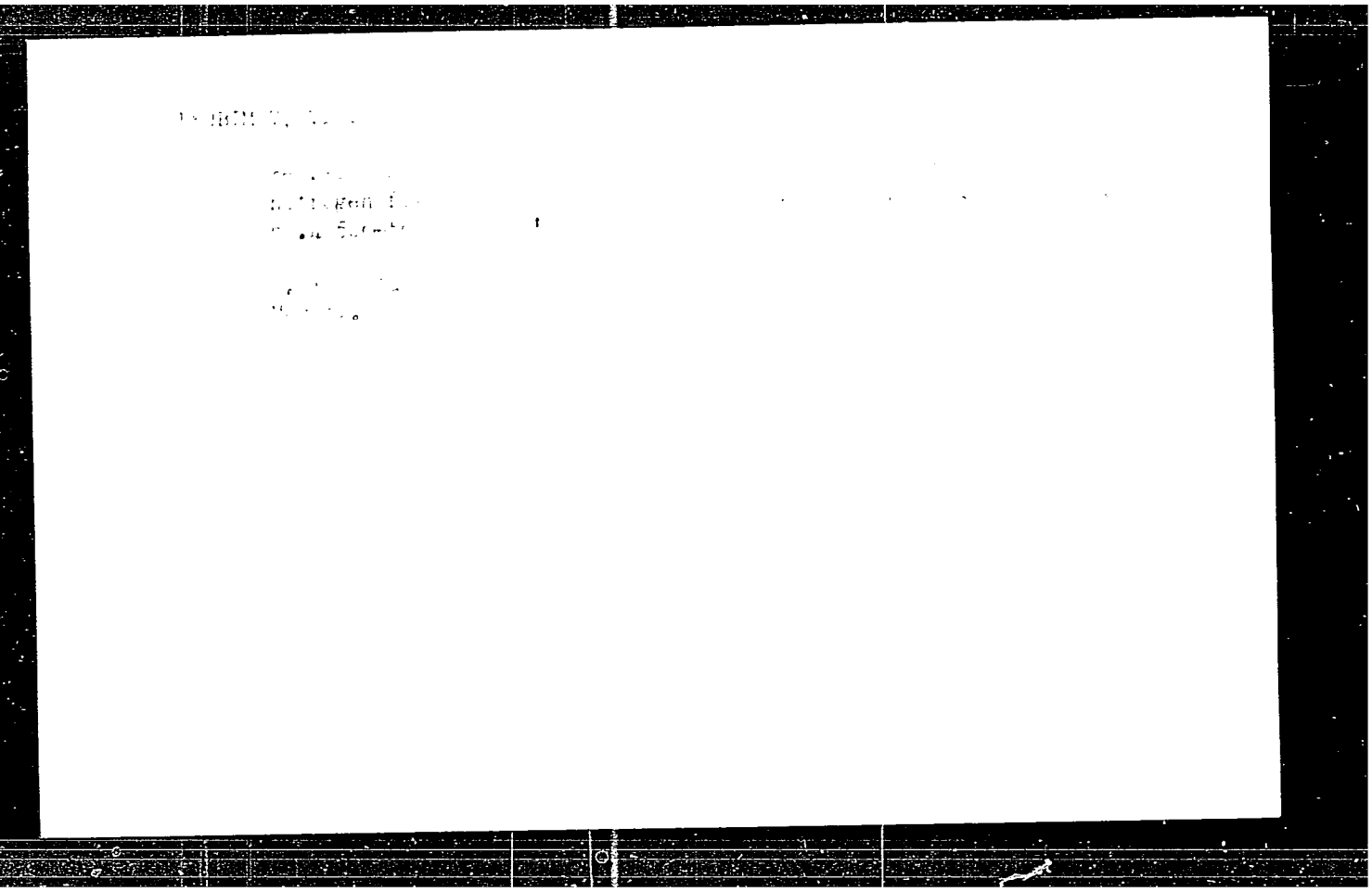
Card 1/1 JO

KRETOVICH, V.L.; LYUBIMOV, V.I., kand.biolog.nauk

Biochemistry of nitrogen fixation. Priroda 53 no. 12:14-21 '64.
(MIRA 18:1)

1. Institut biokhimii im. A.N.Bakha AN SSSR, Moskva.
2. Chlen-korrespondent AN SSSR (for Kretovich).





L 22888-66

ACC NR: AP6013992 SOURCE CODE: UR/0216/65/000/002/0250/0256

AUTHOR: L'vov, N. P.--Lvov, N. P.; Lyubimov, V. I. 30 B

ORG: Agricultural Academy im. K. A. Timiryazev, Moscow (Sel'skokhozyaystvennaya akademiya); Institute of Biochemistry im. A. N. Bakh, AN SSSR, Moscow (Institut biokhimii AN SSSR)

TITLE: Study of the physiology of the new nitrogen-fixing Mycobacterium azot-absorptum sp. n.

SOURCE: AN SSSR. Izvestiya. Seriya biologicheskaya, no. 2, 1965, 250-256

TOPIC TAGS: bacteriology, bacteria, soil bacteriology, nitrogen, amino acid, vitamin, ethyl alcohol, radioisotope

ABSTRACT: Using the isotope method, the authors discovered that Mycobacterium azot-absorptum, isolated from sod-podzolic soil can fix molecular nitrogen in a pure culture. When grown in lactic acid, it fixes nitrogen more vigorously in young cultures than it does in old. When it is grown in ethyl alcohol, active nitrogen fixation occurs in the older cultures but is completely absent in the younger ones. The microorganism does not need vitamins or amino acids for growth and nitrogen fixation. The only prerequisite of these processes is the presence of a small amount of bound nitrogen in the medium. Orig. art. has: 1 figure and 4 tables. [JPRS]

SUB CODE:06,18 / SUBM DATE: 12Nov63 / ORIG REF: 004 / OTH REF: 005

UDC: 576.851.15

Card 1/1 BLG

LYUBIMOV, V.I.; LOSEVA, L.P.; L'VOV, N.P.

Induced character of nitrogen-fixation enzymes in Mycobacterium azot-absorptum n. sp. Izv. AN SSSR.Ser.biol. no.3:392-394 My-Je '65. (MIRA 18:5)

1. Institut biokhimii im. A.N.Bakha AN SSSR i Sel'skokhozyaystvennaya akademiya im K.A.Timiryazeva.

L 25786-66 EWT(m) JD

ACC NR: AP6015918 SOURCE CODE: UR/0216/65/000/003/0394/0397

AUTHOR: Lyubimov, V. I. 31 B

ORG: Institute of Biochemistry im. A. N. Bakh, AN SSSR (Institut biokhimii AN SSSR)

TITLE: New findings on the biochemistry of fixation of molecular nitrogen by microorganisms 27

SOURCE: AN SSSR. Izvestiya. Seriya biologicheskaya, no. 3, 1965, 394-397

TOPIC TAGS: microbiology, biochemistry, plant chemistry, enzyme, nitrogen, plant metabolism

ABSTRACT: This brief article reviews recent successes (as of July 1964) in research at the subcellular and enzyme level on fixation of molecular nitrogen by microorganisms. In particular, the article treats the discovery and subsequent study of ferredoxin, the function of ferredoxin in nitrogen fixation, the part played by hydrogen in nitrogen fixation, and the reconstruction of the nitrogen-fixing enzyme system with nitrogenase. Orig. art. has: 1 table. [JPRS]

SUB CODE: 06 / SUBM DATE: 18Jul64 / ORIG REF: 005 / OTH REF: 013

2

Card 1/1 CC

GFYKO, N.S.; LYUBIMOV, V.I.; KRETOVICH, V.L.

Free keto acids in Azotobacter vinelandii. Izv. AN SSSR. Ser. biol. no.4:944-945 J-A '65. (MIRA 18:8)

1. Institut biokhimii im. A.N. Bakha AN SSSR i Tekhnologicheskiy institut pishchevoy promyshlennosti, Moskva. 2. Chlen-korrespondent AN SSSR (for Kretovich).

GEYKO, N.S.; L'VOV, N.P.; LYUBIMOV, V.I.; KRETOVICH, V.L.

Keto acids of Mycobacterium azot-absorptum sp. n. Dokl. AN SSSR 165 no.3:699-700 N '65. (MIRA 18:11)

1. Institut biokhimii im. A.N. Bakha AN SSSR i Tekhnologicheskiy institut pishchevoy promyshlennosti, Moskva. 2. Chlen-korrespondent AN SSSR (for Kretovich).

LYUBIMOV, Valentin Mikhaylovich; OSTROGORSKIY, Viktor Ivanovich; SHLIONSKIY, Mikhail Semenovich; KISELEVA, T.I., red.izd-va; ATTOPOVICH, M.K., tekhn.red.

[Scraper-type unloading machines] Skrebkovye razgruzochnye mashiny. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1959. 43 p. (MIRA 12:9)
(Loading and unloading)

124-57-2-2175D

Translation from: Referativnyy zhurnal Mekhanika, 1957, Nr 2, p 101 (USSR)

AUTHOR: Lyubimov, V. M.

TITLE: The Problem of the Elastic Equilibrium of an Annular Circular Sector (Zadacha ob uprugom ravnovesii kol'tsevogo krugovogo sektora)

ABSTRACT: Bibliographic entry on the author's dissertation for the degree of Candidate of Physical & Mathematical Sciences presented to the MGU (Moscow State University) Moscow 1956

ASSOCIATION: MGU (Moscow State University) Moscow

Card 1/1

24-58-3-23/38

AUTHOR: Lyubimov, V. M. (Moscow)

TITLE: On the Elastic Equilibrium of a Ring-Shaped Circular Sector (Zadacha ob uprugom ravnovesii kol'tsevogo krugovogo sektora)

PERIODICAL: Izvestiya Akademii Nauk SSSR Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 3, pp. 137-141 (USSR)

ABSTRACT: The 3-dimensional problem is considered of the elastic equilibrium of a ring-shaped sector loaded with given distributed forces on its surfaces. B. G. Galerkin (Ref. 1) obtained for this problem a solution in the form of series, the practical utilization of which involves considerable difficulties. In this paper the approximate method evolved by M. M. Filonenko-Borodich (Refs. 2, 3) is applied which is based on using the variational formulation of Castigliano. According to this method the sought stress tensor is represented as a sum of the basic and the correcting tensors. The basic tensor satisfies the equilibrium conditions and given boundary conditions. The correcting tensor satisfies the equilibrium conditions and the zero boundary conditions and contains a sufficient number of variable parameters. The construction of the correcting tensor for a body of the shape of a sector has been described by Filonenko-Borodich (Ref. 3). In this paper the author considers the construction

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24-58-3-23/38

On the Elastic Equilibrium of a Ring-Shaped Circular Sector

of the basic tensors for some cases of loading of the ring sector. In paragraph 1 the author deals with the derivation of the basic tensor for a ring-shaped sector loaded with a normal load which is symmetrical relative to the symmetry plane of the sector. In paragraph 2 he deals with the application to other conditions of loading of the derived scheme of obtaining the main tensor. The here-considered cases of loading can be utilised for practical calculations after determining experimentally the law distribution along the external surface ($r = r_2$) and the distribution of the reactions in the radial ribs. There are no figures and 3 Soviet references

SUBMITTED: October 19, 1956

Card 2/2

1. Configurations--Mathematical analysis

S/124/60/000/006/020/039
A005/A001

Translation from: Referativnyy zhurnal, Mekhanika, 1960, No. 6, p. 139, # 7733

AUTHOR: Lyubimov, V.M.

TITLE: An Approximate Solution of the Problem of a Loaded Elastic Ring Sector for Certain Special Cases

PERIODICAL: Inzhenernyy sb., 1958, Vol. 26, pp. 137-147

TEXT: The M.M. Filonenko-Borodich method (Prikl. matem. i mekhan., 1953, Vol. 17, No. 4, pp. 465-469 - RZhMekh, 1954, No. 2, # 2223) is applied to the problem of the elastic equilibrium of a ring sector of finite thickness. The fundamental tensors of the solution are compiled by the method mentioned for the cases, when the side face of the sector, including also the radial cuts, is loaded by tangential stresses symmetric to the plane of symmetry of the sector and by normal stresses symmetric to the plane of symmetry perpendicular to the height, as well as for the case of a compound problem, when not stresses but displacements are given at the radial cuts. The planes of the sector bases are assumed to be free of stresses in all cases.

N.A. Rostovtsev

Translator's note: This is the full translation of the original Russian abstract.

Card 1/1

29155
S/508/61/031/000/004/009
D234/D305

10.1500

AUTHOR: Lyubimov, V.M. (Moscow)

TITLE: Some exact solutions of the problem of natural vibrations of a delta wing in a supersonic air stream

SOURCE: Akademiya nauk SSSR. Institut mekhaniki. Inzhenernyy sbornik, v. 31, Moscow, 1961, 171-178

TEXT: The general equations of these vibrations are obtained by adding aerodynamical terms to the equations of free vibrations; the terms are determined with the aid of the "piston theory" discussed by A.A. Ilyushin (Ref. 1: Zakon ploskikh secheniy v aerodinamike bol'shikh sverkhzvukovykh skorostey. PMM, v. 20, no. 6, 1956). The author assumes that the chord is constant and the axis of rigidity coincides with the line of centers of gravity which simplifies the equations. The boundary problems are formulated. There is an independent boundary problem for the angle of torsion θ: $\theta'' - B\theta' + \gamma\theta = 0$; $\theta = 0$ at $x = 0$, $\theta' = 0$ at $x = 1$, whose

Card 1/2

Some exact solutions...

study is affirmed to solve completely the problem of the possibility of flutter and divergence at purely torsional and flexural-torsional movements of the wing. The particular solutions are put in the form of $\theta = e^{k\alpha}$, $k_1 = \alpha + \beta_i$, $k_2 = \gamma - \beta_i$, so that $(\lambda \sin\beta)/\beta + \cos\beta = F(\alpha, \beta) = 0$ The behavior of $F(\alpha, \beta)$ is studied, with the result that flutter and divergence are impossible when the movements are purely torsional. The boundary problem corresponding to the case of purely flexural disturbances is considered by A.A. Movchan (Ref. 3: O kolebaniyakh plastinki, dvizhushcheysya v gase, PMM, v. 31, no. 2, 1956); the author deduces from the results that flutter and divergence are then possible for certain values of a parameter. In the case of flexural-torsional movements there is no flutter or divergence if the frequencies are equal. There are 3 figures and 3 Soviet-bloc references

SUBMITTED: November 17, 1959

Card 2/2

LYUBIMOV, V.M. (Moskva)

Natural vibrations of a cantilever beam in case of noncoinciding rigidity axes and mass centers. Inzh.zhur. 3 no.4:675-681 '63. (MIRA 16:12)

1. Institut mekhaniki AN SSSR.

L 2782-66 EWT(d)/EWT(m)/EWP(w)/EWP(v)/EWP(l)/EWA(h)/ETC(m) WW/EM

ACCESSION NR: AP5021529 UR/0258/65/005/004/0691/0696
533.601.342

AUTHOR: Lyubimov, V. M. (Moscow)

TITLE: Axisymmetric gas vibrations in a cylindrical container, with consideration of the effects of an elastic container end

SOURCE: Inzhenernyy zhurnal, v. 5, no. 4, 1965, 691-696

TOPIC TAGS: gas vibration, gas column vibration, shell vibration, clamped plate vibration

ABSTRACT: The axisymmetric vibrations of a gas in a container having rigid walls except for one end wall (which is considered as a clamped elastic plate) are considered. The differential equations and boundary conditions for the gas and plate vibrations are derived as

$$\frac{\partial^2\Phi}{\partial r^2}+\frac{1}{r}\frac{\partial\Phi}{\partial r}+a^2\frac{\partial^2\Phi}{\partial z^2}=-q^2\Phi,$$

$$\frac{\partial\Phi}{\partial r}=0 \text{ for } r=1,\ \frac{\partial\Phi}{\partial z}=0 \text{ for } z=1,$$

$$\frac{\partial\Phi}{\partial z}=iqW \text{ for } z=0,$$

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ACCESSION NR: AP5021529

$$\left(\frac{d^2}{dr^2}+\frac{1}{r}\frac{d}{dr}\right)\left(\frac{d^2W}{dr^2}+\frac{1}{r}\frac{dW}{dr}\right)=b^2q^2W+iqd^2\Phi(r,\ 0),$$

where $W=\frac{dW}{dr}=0$ for $r=1$,

$a=r_0/l,\ b^2=\mu h^2r_0^2c^2/D,\ d^2=\rho_0r_0c^2l/D,$

using nondimensional coordinates r/r_0, z/l, time tc/r_0 and deflection w/r_0 and assuming $\varphi=lc\Phi(r,\ z)e^{iqt}$, $w=W(r)e^{iqt}$ (where q = nondimensional frequency). After assuming that the solutions are in the form

$$|\Phi|=\sum_1^\infty A_jJ_0(k_jr)\cos n_j(z-1),$$

where k_j = roots of first order Bessel function, that $\beta=\sqrt{bq}$, $J_0(\beta r)$, and $I_0(\beta)$ give solutions to the homogeneous and $W^*(r)$ gives solution to nonhomogeneous equations, the values which are placed on the constants in the solutions by the boundary conditions are evaluated. It is shown that the simultaneous solution to the gas and plate equations can be expressed in terms of a series; the error introduced into the frequency calculations by truncating the series is

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ACCESSION NR: AP5021529

evaluated. Two special cases in which the mathematical solutions simplify are considered, but the physical significance of these mathematical simplifications is not discussed. Orig. art. has: 23 formulas.

ASSOCIATION: none

SUBMITTED: 11Jan65 ENCL: 00 SUB CODE: AS, ME

NO REF SOV: 002 OTHER: 000

Card 3/3 pkd

S/181/62/004/005/041/055
B102/B104

AUTHORS: Lyubimov, V. N., and Venevtsev, Yu. N.

TITLE: Calculation of potentials in hyperstructures

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1064 - 1067

TEXT: The potentials of hyperstructures of crystals of the type ABO_3 with 5 atoms per unit cell are investigated theoretically. The hyperstructures are complexes of unit cells with, for example 20 atoms ($CaTiO_3$, $CdTiO_3$) or 40 atoms (e.g. $PbZrO_3$). In the formation of hyperstructures not only the lattice constants become larger but also the crystallographic axes change their directions in space. Some fundamental considerations are made for the very complicated problem of potential calculation and some general relations written down. A formula is obtained for the relationship between the potentials of the structure field of a unit cell and the potentials of the structure field of a hypercell (which consists of an integral number of unit cells, such as 4 or 8). Formulas giving the relations between the structure coefficients of the

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S/181/62/004/005/041/055
B102/B104

Calculation of potentials . . .

Internal field of the unit cell and hyperstructure are derived for some concrete cases. Not only the nature of electrical properties but also that of other properties of hyperstructures which depend on the potential distribution may be derived from potential calculations. The results obtained make it possible to study the differences in the behavior of the various modifications. There are 2 figures.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova Moskva (Physicochemical Institute imeni L. Ya. Karpov, Moscow)

SUBMITTED: January 25, 1962

Card 2/2

LYUBIMOV, V.N.; VENEVTSEV, Yu.N.; ZHDANOV, G.S.

Ferroelectricity and antiferroelectricity in polar crystals.
Fiz. tver. tela 4 no.8:2123-2127 Ag '62. (MIRA 15:11)

1. Fiziko-khimicheskiy institut imeni L.Ya. Karpova, Moskva.
(Crystals--Electric properties)

S/181/62/004/012/027/052
B125/B102

AUTHORS: Lyubimov, V. N., Venevtsev, Yu. N., Solov'yev, S. P., Zhdanov, G. S., and Bakushinskiy, A. B.

TITLE: The dipole structure and the internal electric fields in $PbZrO_3$

PERIODICAL: Fizika tverdogo tela, v. 4, no. 12, 1962, 3543-3550

TEXT: The most probable values of the internal electric fields and field-induced electron dipoles are calculated for a $PbZrO_3$ crystal on the basis of the model of point dipole structure. Using the method developed by S. P. Solov'yev, Yu. N. Venevtsev, G. S. Zhdanov (Kristallografiya 3, 473, 1958), the determination of the 28 different projections of the electron dipole moments was reduced to the solution of a system of 28 linear algebraic equations for 28 unknowns. The structural sums which are necessary for the set-up of these equations describe the fields of the infinite sublattices of the unit charges and unit dipoles, the number of which exceeds by far 1000. Both the structural sums and the system of

.he dipole structure and the ...

¡uations itself were calculated in various modifications using the electronic computer "Strela". The effect of all structure sublattices on each of the 40 atoms incorporated in the elementary cell was taken into account. The variant P_S was determined by extrapolation for the parameters $e_{Pb} = 1.27$, $e_{Zr} = 1.73$, $e_O = -1$, $\alpha_{Pb} = 4.32 \cdot 10^{-24}$ cm^3, $\alpha_{Zr} = 0.80 \cdot 10^{-24}$ cm^3, $\alpha_O = 2.26 \cdot 10^{-24}$ cm^3. e_i denotes the effective charges and α_i denotes the electron polarizabilities of the ions. The small value of P_S within a certain temperature interval makes it possible to establish a correlation between the data obtained from structure and those from dielectric studies. At room temperature, the ion polarization for the above-mentioned values of the parameters is compensated by electron polarization. Hence, the $PbZrO_3$ crystal is antipolarized and very similar to an anti-electret. Results, similar in principle, are obtained for any of the ten crystallographic polar classes of pyroelectrics (electrets). It is assumed that at least the direction of most of the projections of the electron dipole moments and of the internal fields corresponds to the

The dipole structure and the ...

real structures of $PbZrO_3$ at room temperature. The displacement of the atoms may be attributed to nonelectrostatic forces. The highest field strength acts on the Zr ion. In general the internal field strength increases with decreasing ion polarizability. The rules found for $PbZrO_3$ resemble those governing the ferroelectric crystals $BaTiO_3$ and $PbTiO_3$. It would be useful to investigate $PbZrO_3$ under pressure. There are 7 tables.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva
(Physicochemical Institute imeni L. Ya. Karpov, Moscow)

SUBMITTED: July 9, 1962

31,739
S/070/62/007/001/002/022
E032/E314

24.7100 (1153, 1454)

AUTHORS: Lyubimov, V.N., Venevtsev Yu.N. and Zhdanov G.S.

TITLE: Internal electric fields in $NaTaO_3$ and $CdTiO_3$ crystals

PERIODICAL: Kristallografiya v. 7, no. 1, 1962, 12 - 19

TEXT: The aim of the present calculations was to obtain some information on the electrical properties of the above crystals. It is stated that they have not been extensively investigated and that the published information is to some extent conflicting. Thus, G.A. Smolenskiy (Ref. 1 - Dokl. AN SSSR, 85, 985, 1952; Ref. 2 - Zh. tekhn. fiz., 20, 137, 1950 and Ref. 3 - Dokl. AN SSSR, 70, 405, 1950) reported that $CdTiO_3$ was a ferro-electric with a Curie point at 50 - 60 °K, while J.K. Hulm, B.T. Matthias and E.A. Long (Ref. 4 - Phys. Rev., 79, 885, 1950) did not find these properties. According to the experimental results of B.T. Matthias (Ref. 5 - Amer. Phys. Soc. 24, 28, 1949 and Ref. 6 - Phys. Rev. 75, 1771, 1949), $NaTaO_3$ should be regarded as a ferro-electric while V.A. Isupov

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S/070/62/007/001/002/022
E032/E314

Internal electric fields .

(Ref 8 - Izv. AN SSSR Ser fiz 22, 1504, 1958) describes it as "quasi-ferro-electric". In order to resolve these difficulties the present authors calculate the internal electric fields of the above structures at room temperature Use is made of a modified form of Eq. (10) in the paper by S F Solov yev, Yu.V Venevtsev and G S. Zhdanov (Ref. 10 - Kristallografiya, 5 1960 718) in order to abbreviate the calculations The structural coefficients of $CdTiO_3$ were calculated by P.P. Ewald s method (Ref. 11 - Ann Phys., 64 253 1921) using the Strela computer. Each structural coefficient was determined to four decimal places. The procedure used by the authors enabled them to reduce the number of points for which the coefficients had to be evaluated from 34 to 15. There are 9 structural coefficients for each of these 15 points. Of the resulting total number of 135 there are 74 which are equal to zero. The authors have used this theory to calculate the dipole moment of the superstructure cell and found its antiparallel components The dipole moment and the contribution of ions to the spontaneous polarization

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are given (in units of 10^{-18} ESU) in Table 5. The internal fields (in units of 10^{-8} V/cm), the spontaneous polarization and the structural distortion of various crystals of type ABO_3 are given in Table 6. It is stated that further careful studies of the structural, dielectric and other characteristics of these substances are necessary. Acknowledgments are expressed to S.P. Solov'yev for advice and T.A. Osipova for evaluating the structural sums. There are 6 tables and 17 references: 10 Soviet-bloc and 7 non-Soviet-bloc. The four latest English-language references are: Ref. 4 (quoted in text); Ref. 7 - H.F. Kay, J.L. Miles - Acta crystallogr., 10, 213, 1957; Ref. 12 - H.F. Kay, P.C. Baily - Acta crystallogr., 10, 219, 1957 and Ref. 15 - J.R. Tessman, A.H. Kahn, W. Shockley - Phys. Rev., 92, 890, 1953.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova (Physicochemical Institute im. L.Ya. Karpov)

SUBMITTED: February 15, 1961

S/070/62/007/002/003/022
E132/E186

24,7100

AUTHORS: Lyubimov, V.N., Venevtsev, Yu.N., and Zhdanov, G.S.

TITLE: On a method of calculating the gradients of the internal electric fields in complex dipole structures

PERIODICAL: Kristallografiya, v.7, no.2, 1962, 229-233

TEXT: The problem of calculating the gradients q of the internal electric field in a crystal lattice of any symmetry made up of charges and dipoles is examined. As $q = \text{grad } \underline{E} = -\text{grad } V$ and $\partial E_x/\partial y = \partial E_y/\partial x$, q is a symmetrical tensor with 6 components. In the general case 6m quantities must be calculated to give the field if there are m atoms per unit cell. Inclusion of the symmetry of the unit cell may reduce this to 6n where n is the number of complexes, and simplify the formulae. The symmetry of the ions themselves introduces further simplifications.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova (Physico-chemical Institute imeni L.Ya. Karpov)

Card 1/1

SUBMITTED: April 26, 1961

S/070/62/007/005/011/014
E132/E460

AUTHORS: Lyubimov, V.N., Venevtsev, Yu.N.

TITLE: The formation of dipole configurations in certain structures with special dielectric properties

PERIODICAL: Kristallografiya, v.7, no.5, 1962, 793-794

TEXT: A. Jaskiewicz and H. Konwent (Bull. Acad. polon. Sci. Cl. III, v.9, 1961, 553) have examined the process of the formation of dipole structure in perovskites (ABO_3), although not entirely successfully. An attack on the structure of WO_3 (ReO_3 - type) proves simpler. Here, either the W or the O ions can be ferroelectrically active and the method of trial and error is practicable. For the case where the W ion is active and the dipolar structure is formed because, as a result of the thermal oscillations, the W ion in one cell possesses an initial dipole $(0,0,m_z)$, the field, acting on W ions in neighbouring cells, can be determined by the above method. This gives the case of tetragonal WO_3 consisting of chains of pseudocubic cells, where in each chain the polarization of the cells is directed in one way and in the neighbouring chain oppositely. This is the simplest

configuration known for WO_3. The method cannot be pursued further to give other configurations but some results can be obtained for the NH_4Cl and NH_4Br structures (where the halide ions are active). These are found to be antiferroelectric. The method is only confirmatory and does not disclose new information.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya.Karpova
(Physico-chemical Institute imeni L.Ya.Karpov)

SUBMITTED: February 21, 1962

S/070/62/007/006/018/020
E132/E435

AUTHORS: Lyubimov, V.N., Venevtsev, Yu.N., Koyranskaya, Ye.Yu.

TITLE: Calculation of the gradients of the electric field in ionic crystals

PERIODICAL: Kristallografiya, v.7, no.6, 1962, 949-952

TEXT: It has been shown (... Grin et al. Helv. phys. acta, v.34, 1961, 391) that the contribution of δE_d of the multipolarity of the ions to the field gradient may greatly exceed that, δE_p, of the point charges. This effect would be expected to be particularly great for ferroelectrics with dipole structures. The authors' formula (Kristallogr. v.7, no.2, 1962, 229-233) for calculating δE in a dipole structure is now applied to the tetragonal $BaTiO_3$ (or the general perovskite ABO_3). The structure sums were calculated on the "Minsk" computer. The dipolar contribution to δE of any atom does not exceed 0.7×10^{14} cgsu and is normally between 0.1 and 0.3 x 10^{14}. The true effective charges may, however, differ from those assumed by 20 to 30%. (Assumed $e_A = +1$; $e_B = +2$; $e_{O_I} = e_{O_{II}} = -1$)

Card 1/2

If so, then the contributions of the A and B atoms to δE will not be zero and there will be a dipole contribution of the order of δE_d = approx 0.5×10^{14} cgsu. For the oxygen ions the charge contribution exceeds the dipolar contribution. Inasmuch as the electronic dipoles have the functions of effective charges and their values are only approximately known, their contribution to the dipole structure cannot be calculated accurately. The dynamic corrections to the effective charges can be calculated. For the oxygen this is $\alpha \cdot \delta E$ = approx 4×10^{-10} cgsu. For the Ti the correction is significantly less and is about 0.1 e and the force acting on the charge greatly exceeds that acting on the dipole. This gives grounds for treating the movement of the ferroelectric ion as that of a point charge and not of a dipole. For the other ions the forces are of the same order. For calculating the fields at the nuclei (or nuclear quadrupole resonance, Moessbauer effect etc) quantum mechanical methods are necessary to calculate the Sternheimer constant γ_∞ which must be included. There is 1 table.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya.Karpova (Physico-chemical Institute im. L.Ya.Karpov)

SUBMITTED: March 27, 1962
Card 2/2

S/181/63/005/003/040/046
B102/B180

AUTHOR: Lyubimov, V. N.

TITLE: Spatial symmetry of electric and magnetic dipole structures

PERIODICAL: Fizika tverdogo tela, v. 5, no. 3, 1963, 951-953

TEXT: The possibilities of a coordination of crystal symmetry groups and dipole structural symmetry are investigated. The elementary dipole structure is characterized by the electric polarization vector (electric dipole structure) and by the magnetic polarization vector or the spin vector (magnetic dipole structure). Analysis of all 230 symmetry groups shows that there are groups which always fit the definition of the dipole structure symmetries, independent of the arrangement and number of particles. All the 68 space groups of the 10 pyroelectric classes plus the 17 groups $D_2^{2-5,9}$, $D_4^{3,4,7,8}$, D_3^{3-6} $D_6^{2,3}$, $T^{4,5}$ describe exclusively electric dipole structures. Solely magnetic dipole structures are described by all the 44 space groups of the 13 pyromagnetic classes plus the following 59 groups: $D_2^{2-5,9}$, $D_{2d}^{2-10,12,13,15-17,19,21,22}$,

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S/181/63/005/003/040/046
B102/B180

Spatial symmetry of electric and ...

$D_{2h}^{6-12,14-16,18,27}$, $D_4^{3,4,7,8}$, $C_{4v}^{5,6,8,12}$, $D_{2d}^{4,12}$, D_3^{3-6}, $C_{3v}^{3,4,6}$, $D_6^{2,3}$, C_{6v}^2, $T^{4,5}$, $T_h^{6,7}$, and T_d^6. The 24 space groups belonging to the 6 classes having commonly pyroelectric and pyromagnetic properties always have structures corresponding to electric and magnetic dipoles at the same time.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva
(Physicochemical Institute imeni L. Ya. Karpov, Moscow)

SUBMITTED: November 12, 1962

Card 2/2

L 12808-63 EWT(1)/EWP(q)/EWT(m)/BDS AFFTC/ASD/ESD-3 JD/IJP(C)
ACCESSION NR: AP3000762 S/0070/63/008/003/0313/0318

AUTHOR: Lyubimov, V. N.; Zheludev, I. S.

62
59

TITLE: Dipole and nondipole crystalline structures

SOURCE: Kristallografiya, v. 8, no. 3, 1963, 313-318

TOPIC TAGS: symmetry group, space group, dipole structure, nondipole structure, axial-dipole structure, crystal structure

ABSTRACT: It is shown that of all the 230 space symmetry groups in crystals, 85 describe pole-dipole crystalline structures exclusively, 103 describe axial-dipole structures exclusively, and 66 describe structures that are exclusively one-dimensional polar and axial dipolar. The presentation is based on defined properties and configurations of the various groups, and the results derive from an analysis of these data. The authors discuss the crystallographic conditions necessary for realization of nondipole structure. Dipole structure, in their sense of the word, is uniquely determined by point symmetry only in pyroelectric and pyromagnetic classes, and nondipole structure is uniquely determined only in "gray" classes. In all remaining classes the assignment of a single point symmetry is inadequate. Dipole structure is uniquely determined by space groups if these groups refer to that category of groups describing dipole structure

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